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IS 7778-4 (2003): Small Tools Sampling Inspection Procedures, Part 4: Screwing Taps, Dies and Knurling Tools [PGD 32: Cutting tools]



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छोटे औजारों की नमूना निरीक्षण की प्रक्रिया
भाग 4 सक्रुडिंग टैपस, डाइस और नरलिंग औजार
(पहला पुनरीक्षण)

Indian Standard
SMALL TOOLS SAMPLING INSPECTION
PROCEDURES
PART 4 SCREWING TAPS, DIES AND KNURLING TOOLS
(*First Revision*)

ICS 25.100.50

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FOREWORD

This Indian Standard (Part 4) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Drills, Reamers and Threading Tools Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This standard was first published in 1975. In the light of experience gained over the years, in this revision following changes have been incorporated:

- a) Definition of various terminologies used in the standard have been aligned with the practice followed at ISO level.
- b) Scale of sampling and criteria of conformity have been modified.
- c) Classification of non-conformities for various type of cutting tools have been updated.
- d) To cater the specific need of the different industries and to make this standard user friendly, this standard has been splitted in 11 Parts for easy adoption/acceptance and guide updation.

This standard has been prepared based on prevalent practice and experience available in the Indian Industries. While formulating this standard considerable assistance has been derived from IS 2500 (Part 1) : 2000 'Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection (*third revision*)'. IS 7778 'Small tools sampling inspection procedures' is now being published in 11 Parts. Other parts of the standard are given below:

- Part 1 Twist drills, countersinks and counterbores
- Part 2 Reamers
- Part 3 Sleeves, sockets and adaptors
- Part 5 Milling cutters
- Part 6 Milling arbors and accessories
- Part 7 Gear cutting tools and broaches
- Part 8 Saws
- Part 9 Single point (HSS and carbide tipped) tools
- Part 10 Carbide tips and indexable inserts
- Part 11 Hard metal burrs

Indian Standard

SMALL TOOLS SAMPLING INSPECTION PROCEDURES

PART 4 SCREWING TAPS, DIES AND KNURLING TOOLS (First Revision)

1 SCORE

This standard (Part 4) specifies sampling plans and procedures for screwing taps, dies and knurling tools submitted for inspection in lots.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

| IS No. | Title |
|-------------------------|--|
| 2500 (Part 1) : 2000 | Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection (<i>third revision</i>) |
| 4905 : 1968 | Methods for random sampling |

3 TERMINOLOGY AND DEFINITIONS

For the purpose of this standard the following definitions shall apply. For terms not defined below and for other clarifications, reference may be made to IS 2500 (Part 1).

3.1 Defect

A departure of a quality characteristic that results in a product, process or service not satisfying its intended normal usage requirements.

3.2 Non-Conformity

A departure of a quality characteristic that results in a product, process or service not meeting a specified requirement. Non-conformities will generally be established by their degree of seriousness, such as:

- Class A — Those non-conformities of a type considered to be of the highest concern for the product or service. In acceptance sampling, such types of non-conformity will be assigned very small AQL values.
- Class B — Those non-conformities of a type considered to have the next lower degree of concern. Therefore these can be assigned a larger AQL value than those

in class A and smaller than in Class C, if a third class exists.

3.3 Non-Conforming Unit

A unit of product or service containing at least one non-conformity. Non-conforming units will generally be classified by their degree of seriousness such as:

- Class A — A unit which contains one or more non-conformities of Class A and may also contain non-conformities of Class B and/or Class C.
- Class B — A unit which contains one or more non-conformities of Class B and may also contain non-conformities of Class C, but contains no non-conformity of Class A.

3.4 Percent Non-Conforming

The percent non-conforming of any given quantity of units of products is 100 times the number of non-conforming units divided by the total number of units of products, that is

Percent non-conforming

$$= \frac{\text{Number of non-conforming units}}{\text{Total number of units}} \times 100$$

3.5 Acceptable Quality Level (AQL)

When a continuous series of lots is considered, the quality level which for the purpose of sampling inspection is a limit of a satisfactory process average.

3.6 Sampling Plan

A specific plan which indicates the number of units of products from each lot which are to be inspected (sample size or series of sample sizes) and the associated criteria for determining the acceptability of the lot (acceptance and rejection numbers).

3.7 Lot

A collection of units of product from which a sample shall be drawn and inspected to determine conformance with the acceptability criteria, and which may differ from a collection of units designated as a lot for other purposes (for example, production, shipment, etc).

3.8 Sample

A sample consists of one or more units of product drawn from a lot, the units of the sample being selected

at random without regard to their quality. The number of units of product in the sample is the sample size.

4 SCALE OF SAMPLING

4.1 All small tools shall be selected at random from a lot as per IS 4905 to ensure randomness of selection.

4.2 Small tools shall be selected and examined for each lot separately for ascertaining its conformity to the requirements of the relevant specification.

The number of small tools to be selected from a lot shall depend on the sizes of the lot and type of sampling plans and shall be in accordance with Tables 1, 2 and 3.

5 DETERMINATION OF ACCEPTABILITY

5.1 To determine acceptability of a lot under percent non-conforming inspection, the single sampling plan shall be used in accordance with 5.1.1 for hardness test and performance test and the double sampling plan

shall be used in accordance with 5.1.2 for dimensional and visual characteristics.

5.1.1 Single Sampling Plan

The number of sample units inspected shall be equal to the sample size given by the plan. If the number of non-conforming units found in the sample is equal to or less than the acceptance number, the lots shall be considered acceptable. If the number of non-conforming units is equal to or greater than the rejection number, the lot shall be considered not acceptable.

5.1.2 Double Sampling Plan

The number of sample units first inspected shall be equal to the first sample size given by the plan. If the number of non-conforming units found in the first sample is equal to or less than the first acceptance number, the lot shall be considered acceptable. If the number of non-conforming units

Table 1 Scale of Sampling and Criteria for Conformity for Lot Quality for Visual and Dimensional Characteristics (Double Sampling Plan for Normal Inspection — Inspection Level III)
(Clause 4.2)

| Sl No. | Lot Size | Sample | Sample Size | Cumulative Sample Size | Non-Conformity | | | |
|--------|----------------|--------|-------------|------------------------|--------------------|-----|--------------------|-----|
| | | | | | Class A AQL 1.5 | | Class B AQL 4.0 | |
| | | | | | Ac | Re | Ac | Re |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| i) | Up to 150 | First | 20 | 20 | 0 | 2 | 1 | 4 |
| | | Second | 20 | 40 | 1 | 2 | 4 | 5 |
| ii) | 151 to 280 | First | 32 | 32 | 0 | 3 | 2 | 5 |
| | | Second | 32 | 64 | 3 | 4 | 6 | 7 |
| iii) | 281 to 500 | First | 50 | 50 | 1 | 4 | 3 | 7 |
| | | Second | 50 | 100 | 4 | 5 | 8 | 9 |
| iv) | 501 to 1 200 | First | 80 | 80 | 2 | 5 | 5 | 9 |
| | | Second | 80 | 160 | 6 | 7 | 12 | 13 |
| v) | 1 201 to 3 200 | First | 125 | 125 | 3 | 7 | 7 | 11 |
| | | Second | 125 | 250 | 8 | 9 | 18 | 19 |

Table 2 Scale of Sampling and Criteria for Conformity for Lot Quality for Hardness Test (Single Sampling Plan for Normal Inspections — Inspection Level I)
(Clause 4.2)

| Sl No. | Lot Size | Sample Size | AQL 1.5 | |
|--------|----------------|-------------|---------|-----|
| | | | Ac | Re |
| (1) | (2) | (3) | (4) | (5) |
| i) | Up to 280 | 8 | 0 | 1 |
| ii) | 281 to 1 200 | 32 | 1 | 2 |
| iii) | 1 201 to 3 200 | 50 | 2 | 3 |

Table 3 Scale of Sampling and Criteria for Conformity for Lot Quality for Performance Test (Single Sampling Plan for Reduced Inspection — Inspection Level S-3)
(Clause 4.2)

| Sl No. | Lot Size | Sample Size | AQL 4.0 | |
|--------|--------------|-------------|---------|-----|
| | | | Ac | Re |
| (1) | (2) | (3) | (4) | (5) |
| i) | Up to 150 | 2 | 0 | 1 |
| ii) | 151 to 3 200 | 5 | 0 | 2 |

found in the first sample is equal to or greater than the first rejection number, the lot shall be considered not acceptable.

If the number of non-conforming units found in the first sample is between the first acceptance and rejection numbers, a second sample of the size given by the plan shall be inspected. The number of non-conforming units found in the first and second samples shall be accumulated. If the cumulative number of non-conforming units is equal to or less than the second acceptance number, the lot shall be considered

acceptable. If the cumulative number of non-conforming units is equal to or greater than the second rejection number the lot shall be considered not acceptable.

6 CLASSIFICATION OF NON-CONFORMITY

Non-conformities of various inspection parameters for screwing taps, dies and knurling tools covered under various Indian Standards have been classified as Class A and Class B and are tabulated in Tables 4, 5 and 6 respectively.

Table 4 Classification of Non-Conformity in Screwing Taps

(Clause 6)

| Sl No. | IS No. | Type of Tool | Class A Non-Conformity | Class B Non-Conformity |
|--------|---------------|--|--|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | 6175 (Part 1) | Hand and short machine screwing taps for ISO Metric screw threads sizes M1-M2.5 | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Neck length, Square length and Square width |
| ii) | 6175 (Part 2) | Hand and short machine screwing taps for ISO Metric screw threads sizes M3-M10 | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Neck diameter, Neck length, Square length and Square width |
| iii) | 6175 (Part 3) | Hand and short machine screwing taps for ISO Metric screw threads sizes M3 to M100 | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |
| iv) | 6175 (Part 4) | Long shank machine screwing taps for ISO Metric screw threads sizes from M3 to M24 | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |
| v) | 6175 (Part 5) | Nut screwing taps for ISO metric screw threads sizes M3 to M68 with coarse pitch | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |
| vi) | 6175 (Part 6) | Screwing taps for pipe threads, parallel 'G' series | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |
| vii) | 6175 (Part 7) | Screwing taps for pipe threads, parallel Rp series | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |
| viii) | 6175 (Part 8) | Screwing taps for pipe threads, taper Rc series | Hardness, Major diameter, Pitch diameter, Shank diameter and Pitch | Thread length, Overall length, Square length and Square width |

Table 5 Classification of Non-Conformity of Dies
(Clause 6)

| Sl No. | IS No. | Type of Tool | Class A Non-Conformity | Class B Non-Conformity |
|--------|--------|--|--|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | 5618 | Circular thread cutting dies for conduit threads | Hardness, d diameter, d_1 diameter and Pitch | Width l and Dimensions a, b, c, d_2 and e |
| ii) | 5702 | Flat thread rolling dies | Hardness, Thread dimensions | — |
| iii) | 8405 | Circular thread rolling dies | Hardness, Bore diameter and Thread dimensions | Keyway and Die width |
| iv) | 12321 | Circular screwing dies for ISO metric threads | Hardness, Diameter d_1 and d_2 and Pitch | Dimensions $d_3, d_4, h_1, h_2, m, n_1$, and n_2 |
| v) | 12322 | Circular screwing dies for taper pipe threads R-series | Hardness, Diameter d_1, d_2 and Pitch | Dimensions h_1, h_2, m, d_4, d_5 and n |
| vi) | 12323 | Circular screwing dies for pipe threads G-series | Hardness, Diameter d_1 and d_2 and Pitch | Dimensions h, m and d_4 |
| vii) | 12324 | Hexagonal die nuts | Hardness, Diameter d_1 and Pitch | Dimensions e, s and h |
| viii) | 12325 | Circular screwing dies for ISO metric conduit pipe threads | Hardness, Diameter d and d_1 and Pitch | Dimensions h, n, n_2, m , and d_4 |

Table 6 Classification of Non-Conformity in Holders, Wrenches, Extension Bars and Knurling Wheels
(Clause 6)

| Sl No. | IS No. | Type of Tool | Class A Non-Conformity | Class B Non-Conformity |
|--------|--------|--|--|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | 3239 | Die holders for circular screwing dies | Diameter d_1 | Dimensions $h, a, d_2, d_3, d_4, d_5, l_1, l_2$ and t |
| ii) | 4914 | Tap wrenches, adjustable | Hardness, Dimensions b and d | Dimensions l_1, l_2 and h |
| iii) | 4921 | Extension bars | Hardness, Dimension a | Dimensions d_1, d_2, l, l_1, l_2 and L |
| iv) | 6776 | Knurling wheels | Hardness, Dimensions b and d , Pitch and Helix Angle | Dimensions D and P |
| v) | 11127 | Holders for knurling wheels | Hardness | Dimensions b, h and L |

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